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# DOE/NASA CONTRACTOR REPORT

DOE/NASA CR-150785

## PROTOTYPE SOLAR HEATING AND HOT WATER SYSTEMS (Quarterly Reports)

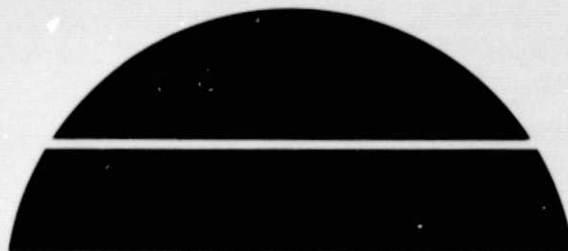
Prepared from documents furnished by

Colt, Inc. of Southern California  
71-590 San Jacinto Drive  
Rancho Mirage, California 92270

Under Contract NAS8-32242 with

National Aeronautics and Space Administration  
George C. Marshall Space Flight Center, Alabama 35812

For the U. S. Department of Energy



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# U.S. Department of Energy



## Solar Energy

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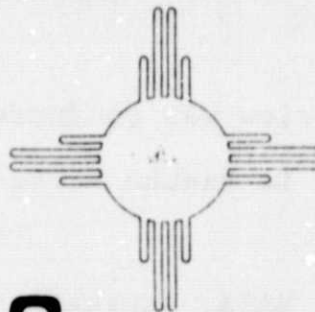
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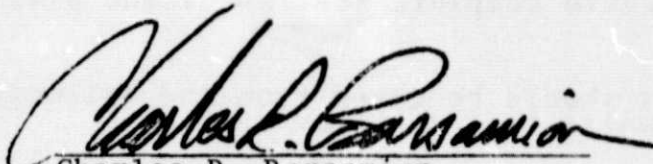
Fifth Quarterly Progress Report  
COLT HEATING & HOT WATER HEATING SOLAR PROGRAM  
NASA Contract NAS 8-32242

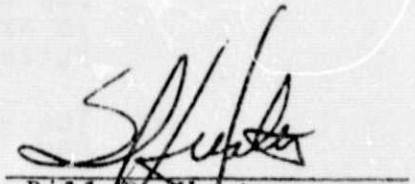
For the time period  
October 1, 1977 thru March 31, 1978

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**COLT INC.**  
OF SOUTHERN CALIFORNIA  
ENERGY SYSTEMS DIVISION

  
Charles R. Barsamian  
Project Engineer

  
Bill D. Hunter  
Project Manager

71-590 SAN JACINTO DRIVE/RANCHO MIRAGE, CALIFORNIA 92270 (714) 346-8033



## 1.0 Summary

This is the Fifth Quarterly Progress Report under NASA Contract NAS 8-32242 to Colt, Inc. for the development of a solar hot water and space heating system. This report covers the period October 1, 1977 thru March 31, 1978, six months; and serves as the two quarterly reports for that period. This report provides a status of current scheduling and provides an inclusive summary of the current technical status.

## 2.0 Contracts

The First Article Review was conducted on October 14, 1977, at the Colt facility in Rancho Mirage. Those in attendance were:

Mr. Mitchell Cash, NASA, Marshall Space Flight Center, AL

Mr. Irwin Simon, NASA, Marshall Space Flight Center, AL

Mr. Bill Hunter, Colt, Inc. Rancho Mirage

Mr. Charles Barsamian, Colt, Inc. Rancho Mirage

A number of modifications to Colt's assembly methods were offered as suggestions. These include the following:

- (a) 1" aluminum vents are added to the upper area on the collector back plate.
- (b) It is necessary to thoroughly clean the glass cap and housing of all aluminum drill shavings in order to assure complete sealing of the glass surface.
- (c) The vent holes should be moved from the collector housing side walls to the bottom wall.

The Quarterly Review was also conducted with the same attendees. During the review it was suggested that Colt provide a torque requirement for the installation of the flexible connectors. Colt was instructed to supply thermal tape for the piping at the Pueblo Operational Test Site.

An Informal Design Review was conducted at the Colt facility in Rancho Mirage on November 4, 1977, by D.O.T. and NASA. Those in attendance were:

Mr. John Massey, NASA, Marshall Space Flight Center, AL  
Mr. Henry Brink, D.O.T. Pueblo  
Mr. Chuck Barsamian, Colt, Inc. Rancho Mirage

On March 30, 1978, Mr. Bill Hunter conducted a training and indoctrination session for D.O.T. personnel on the installed solar systems at the Pueblo operational test site.

The test site equipment installation was reviewed and the installation was accepted subject to correction or completion of the following:

- (a) Completion of all insulation, including temperature sensor weather-heads.
- (b) Updating of system and installation drawings.
- (c) Providing power consumption and length of heat tape on each pipe loop.
- (d) Update on control logic, including auxiliary gas heater and blower control.

- (e) Providing the R value for pipe insulation on each side of the 3 loops.
- (f) Disconnecting the heat tape on the circulating oil line.
- (g) Modify the tank manhole cover shape to prevent condensate from running down the side of the tank.
- (h) Submission of the **data** to be mailed to MSFC under data requirement 504-12.

### 3.0 Schedules

Figure 1 indicates the current program schedule. Colt, Inc. is proceeding on this schedule without slippage. This schedule has been previously adjusted, however, to reflect the following:

- (a) Slippage caused by a leak of undetermined origin in the Yosemite Operational Test Site heat exchanger manifold.
- (b) Inclement weather delaying verification testing.

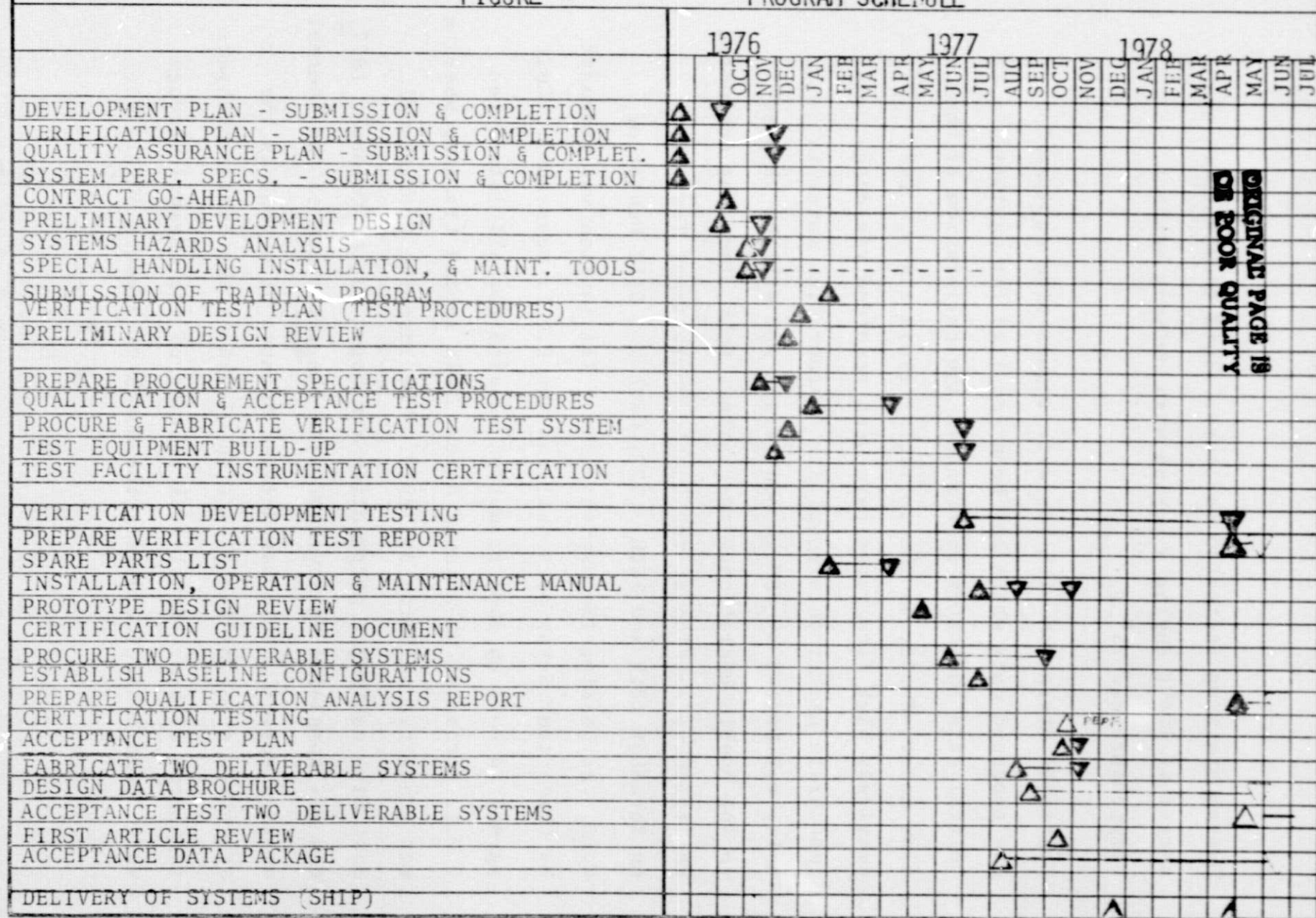
### 4.0 Technical Status

Equipment preparation for the Pueblo Operational Test Site was completed on October 14, 1977 at which time the First Article Review was conducted. (Refer to Contract, Section 2.0) This equipment was shipped to the Pueblo Operational Test Site on November 15, 1977 by Global Van Lines under Government Bill of Lading #E242347 and arrived at the test site on November 18, 1977. Installation of the equipment commenced at that time and was completed during the month of February 1978.



FIGURE 1

## PROGRAM SCHEDULE



PROGRAM SCHEDULE  
AS OF

PLANNED

△ INITIATE

▽ COMPLETE

ACCOMPLISHED

△ INITIATE

▽ COMPLETE

○ POSSIBLE SLIP

● ACTUAL SLIP

△ FIRST RESCHEDULE

System start-up indicated collector fluid temperatures in excess of 150°F during a period when outside ambient temperature was 25° F.

Continued operation with the data acquisition equipment has produced data which has been compiled for analysis. Initial data indicates an error in the calibration of the flow meter, W-100, in the collector fluid lines. Excessively high flow rates have been recorded yielding inaccurate performance results. Another flow meter is being calibrated by IBM in Huntsville and will be shipped to the Pueblo operational test site. Colt, Inc. has conducted the training session at the Pueblo Operational Test Site on November 14th and 15th, 1977, with Mr. Bill Hunter of Colt, Inc. making the presentation. The session was attended by three contractor personnel and two D.O.T. personnel. Colt agreed to hold an indoctrination session for all interested D.O.T. personnel at a later date. This second training session was conducted on March 30, 1978. The Yosemite Operational Test Site equipment preparation was begun during October, 1977 and was completed in November with the exception of the thermal storage vessel. This was delayed because of a leak in the stainless steel manifold section of one of the heat exchangers installed within. Final leak testing of the thermal storage vessel was conducted during the month of January 1978. The

equipment has been quality assurance tested and is now awaiting NASA inspection during the First Article Review. Preliminary testing of the modified Colt collector was initiated during the month of October, 1977. Completion of this testing was delayed until February, 1978, due to inclement weather conditions.

The following data was submitted during this reporting period.

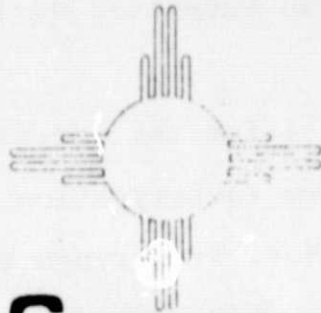
- (a) D. D. 633-4 for the performance test and UL Preliminary Investigation, October 3, 1977.
- b) R. I. D. Nos. 52 through 63, November 1, 1977.

Sixth Quarterly Progress Report

COLT HEATING & HOT WATER HEATING SOLAR PROGRAM

NASA Contract NAS 8-32242

For the Time Period  
April 1, 1978 thru June 30, 1978



**GALT INC.**  
OF SOUTHERN CALIFORNIA  
ENERGY SYSTEMS DIVISION

A handwritten signature in cursive script, reading "Charles R. Barsamian".

Charles R. Barsamian  
Project Engineer

A handwritten signature in cursive script, reading "Bill D. Hunter".

Bill D. Hunter  
Project Manager

71 590 SAN JACINTO DRIVE/RANCHO MIRAGE, CALIFORNIA 92270 (714) 346-8033



## 1.0 Summary

This is the Sixth Quarterly Progress Report under NASA Contract NAS 8-32242 to Colt Inc. for the development of a solar hot water and space heating system. This report covers the period April 1, 1978 through June 30, 1978, a period of three months. This report provides a status of current scheduling and costing and provides an inclusive summary of the current technical status.

## 2.0 Contracts

The Quarterly Review for the two quarters, September 1, 1977 to December 31, 1977; and January 1, 1978 to March 31, 1978, was conducted at the Colt facility in Rancho Mirage on April 14, 1978.

Those in attendance were:

Mr. Mitchell Cash	NASA, MSFC
Mr. Robert Schmidt	DCAS
Mr. Bill Hunter	Colt Inc.

The Pueblo Acceptance Review was discussed at length with special attention directed toward the following:

- (a) Heat tape power consumption per line.
- (b) The gas furnace fan control logic.
- (c) The "as-built" drawings.
- (d) The issuance of four change proposals as follows:
  - 1. Maintenance extension to September 1979 at the Pueblo Operational Test Site.
  - 2. Sensor replacement at the Pueblo Operational Test Site.
  - 3. U.L. Testing
  - 4. Certification Testing



The First Article Review was conducted on April 14, 1978 with the same attendees. The Yosemite Operational Test Site equipment build-up was discussed and a decision was made to apply "foamed-in-place" polyurethane foam to the bottom half of the thermal storage tank.

A Design Review was conducted at the Colt facility in Rancho Mirage on Wednesday May 21, 1978. Those in attendance were:

Mr. Mitchell Cash	NASA, MSFC
Mr. Irwin Simon	NASA, MSFC
Mr. Bill Hunter	Colt Inc.
Mr. Chuck Barsamian	Colt Inc.

The Pueblo Operational Test Site Thermal Storage Vessel was discussed as follows:

1. Condensation from the vessel collects inside the manhole cover and runs down the outside of the tank, soaking the insulation.
2. The insulation was thoroughly soaked due to a leak in the D.O.T. facility during a rain storm necessitating a complete replacement of the insulation. The plywood structure housing the vessel has begun to delaminate due to this leak also.
3. The instrumentation replacement, Change Proposal #CP-007 was finalized.
4. The maintenance extension, Change Proposal #CP-005 was clarified and finalized.

5. A filter is to be added to the Thermal Storage Vessel fluid line on the suction side of the water pump.

### 3.0 Schedules

Figure 1 indicates the current program schedule. Colt Inc. is proceeding on this schedule without slippage. All contractual requirements, with the exception of the completion of the Yosemite Operational Test Site Installation, have been completed. The Verification/Qualification Test Report, the Acceptance Data Package, the Design Data Brochure will all be submitted in July 1978.

### 4.0 Technical Status

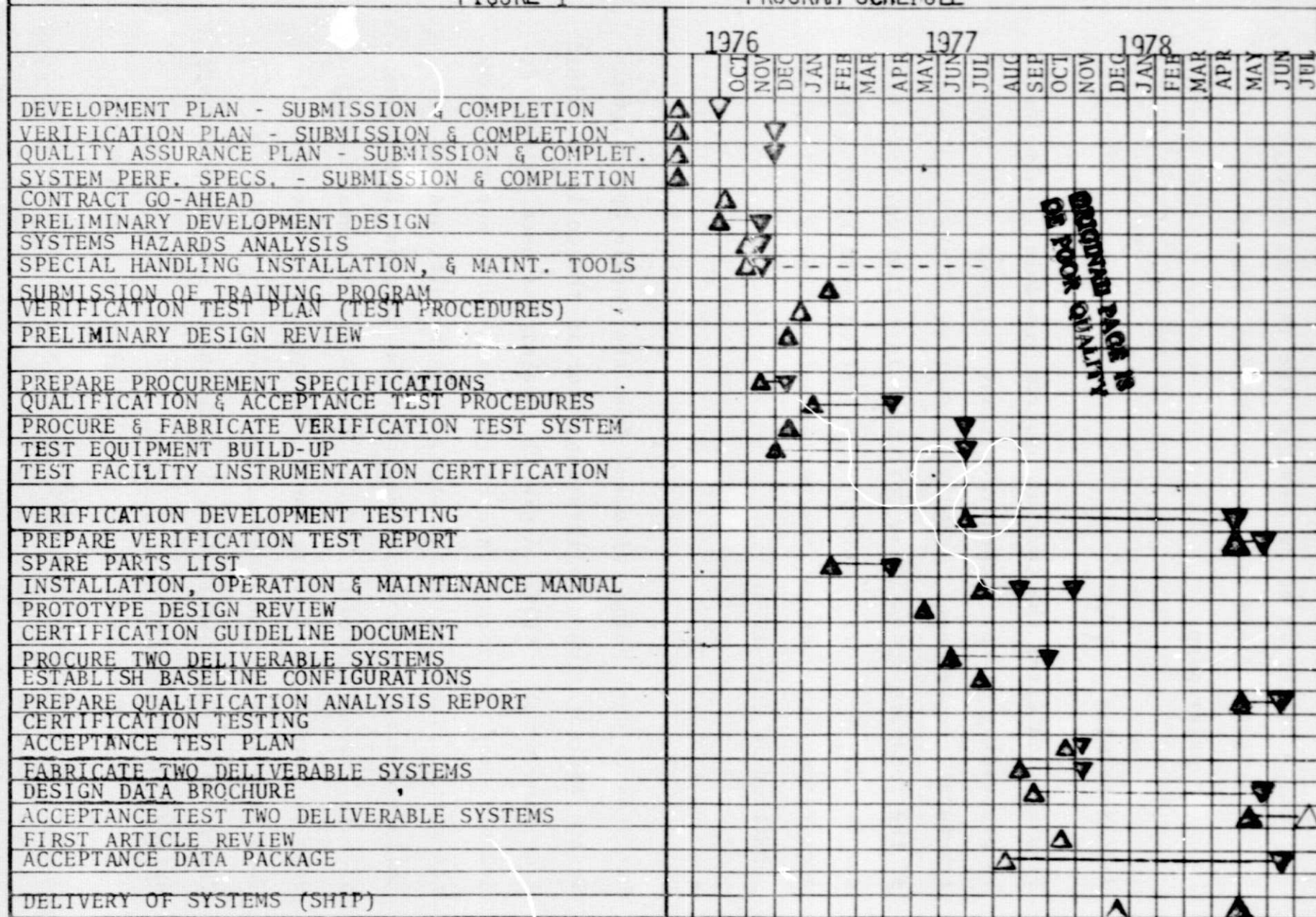
Performance data being collected from the Pueblo Operational Test Site indicated a calibration error in the collector fluid line flow meter - W100. A new flow meter has been installed, however, the operating range of this meter does not encompass the actual flow rate in the line. As a result, none of the collected data yield valid results. The original flow meter is being recalibrated by IBM, in Huntsville Alabama, and will soon be reinstalled. Acceptance testing at the Operational Test Site will be continued at that time.

The Yosemite Operational Test Site hardware and equipment was shipped in two stages:

1. The Thermal Storage Tank was sent by System 99, on Monday April 24, 1978.

FIGURE 1

## PROGRAM SCHEDULE



PROGRAM SCHEDULE  
AS OF

PLANNED

△ INITIATE

▽ COMPLETE

ACCOMPLISHED

▲ INITIATE

▼ COMPLETE

○ POSSIBLE SLIP

● ACTUAL SLIP

△ FIRST RESCHEDULE



2. The remaining equipment and hardware was sent on Tuesday June 13, 1978, by Global Van Lines.

The Thermal Storage Tank was installed on Monday, May 8, 1978 and the plywood enclosure was constructed shortly afterward. Two Colt Inc. employees were on hand at the Operational Test Site on Monday June 19, 1978 to unload and inventory the equipment sent as part of the second shipment. Installation of the solar panels was commenced on Tuesday June 20, 1978. This installation is proceeding according to internal scheduling, and no problems have been encountered which will cause slippage in the scheduled completion date of July 21, 1978.

The following data has been submitted during this reporting period:

Change Proposals #CP-004, CP-005, CP-006 and CP-007, on May 12, 1978.